

AMENDMENTS TO THE CLAIMS

Please amend the claims as follows:

1-81. (Cancelled)

82. (Previously Presented) An apparatus, comprising:

a manipulandum oriented along a longitudinal axis;

a linkage coupled to the manipulandum, the linkage configured to allow the manipulandum to move in at least two rotational degrees of freedom with respect to ground, the linkage further configured to allow the manipulandum to move in a translational degree of freedom through an aperture of a portion of the linkage along the longitudinal axis, the linkage including a plurality of elements, at least a subset of elements from the plurality of elements being flexible and moveable to allow said manipulandum to move in at least one of said at least two degrees of freedom with respect to ground; and

at least one sensor configured to detect at least one of a position and a movement of the manipulandum in the at least two degrees of freedom and output a sensor signal based on the detected at least one of the position and the movement.

83. (Previously Presented) The apparatus of claim 82, further comprising an actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force along at least one of the at least two degrees of freedom.

84. (Previously Presented) The apparatus of claim 82, wherein the linkage includes:

a ground member configured to be coupled to a ground surface;
a first extension member and a second extension member, the first extension member and the second extension member being coupled to the ground member; and
a first central member and a second central member, the first central member having an end coupled to the first extension member, the second central member having an end coupled to the second extension member, the first central member and the second central member being coupled to each other at ends opposite the ends coupled to the first extension member and the second extension member.

85. (Previously Presented) The apparatus of claim 82, wherein the linkage includes:
a ground member configured to be coupled to a ground surface;
a first extension member and a second extension member, the first extension member and the second extension member being coupled to the ground member; and
a first central member and a second central member, the first central member having an end flexibly coupled to the first extension member, the second central member having an end flexibly coupled to the second extension member, the first central member and the second central member being coupled to each other at ends opposite the ends coupled to the first extension member and the second extension member.

86. (Previously Presented) The apparatus of claim 82, wherein the linkage includes:
a ground member configured to be coupled to a ground surface;
a first extension member and a second extension member, the first extension member and the second extension member being coupled to the ground member; and

a first central member and a second central member, the first central member having a first end coupled to the first extension member, the second central member having a first end coupled to the second extension member, a second end of the first central member and a second end of the second central member being coupled to each other, the ground member being rotatably coupled to the first extension member and the second extension member by bearings, the bearings configured to permit rotation of the first extension member and the second extension member.

87. (Previously Presented) The apparatus of claim 82, wherein at least one element from the subset of elements is narrower in a dimension in which that element is configured to flex, and is wider in other dimensions in which that element is configured to be substantially inflexible.

88. (Previously Presented) The apparatus of claim 82, further comprising:

a first actuator coupled to the linkage, the actuator configured to output via the subset of elements a feedback force in at least one of the at least two degrees of freedom based on the sensor signal; and

a second actuator coupled to the ground member, the second actuator being configured to apply a feedback force in at least one of the at least two degrees of freedom based on the sensor signal, the feedback force associated with the second actuator being different from the feedback force associated with the first actuator.

89. (Previously Presented) The apparatus of claim 82, further comprising an actuator coupled to the linkage, the actuator configured to output via the subset of elements a

feedback force along at least one of the at least two degrees of freedom, the actuator including a voice coil actuator configured to impart the feedback force on the manipulandum.

90. (Currently Amended) An apparatus, comprising:

a manipulandum having a shaft oriented along a longitudinal axis and configured to be moveable in at least two rotational degrees of freedom about axes of rotation with respect to ground;

a first member coupled to the shaft of the manipulandum and having an aperture configured to allow the manipulandum to move along the longitudinal axis in a translational degree of freedom with respect to ground;

a second member coupled to the first member and having a flexible characteristic;
and

a third member coupled to the first member and having a flexible characteristic.

91. (Cancelled)

92. (Previously Presented) The apparatus of claim 90, wherein, the second member has a first dimension about which the second member is configured to flex, and has a second dimension about which the second member is configured to be substantially inflexible.

93-101. (Cancelled)

102. (Previously Presented) The apparatus of claim 90, further comprising: an actuator coupled to the manipulandum, the actuator configured to output a feedback force along at least one of the at least two degrees of freedom.

103. (Previously Presented) The apparatus of claim 90, further comprising: a sensor configured to detect a position of the manipulandum along at least one of the at least two degrees of freedom and output a sensor signal based on the detected position.

104. (Previously Presented) The apparatus of claim 90, wherein the manipulandum includes one of a simulated surgical tool, a stylus, or a joystick.

105. (Previously Presented) The apparatus of claim 90, wherein, the third member has a first dimension about which the third member is configured to flex, and has a second dimension about which the third member is configured to be substantially inflexible.

106. (Currently Amended) The apparatus of claim 90, wherein the ~~first~~ second member is coupled to a first inflexible extension member and the ~~second~~ third member is coupled to a second inflexible extension member, wherein the first and second extension members are coupled to ground.